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U.S. ARMY TEST AND EVALUATION COMMAND  
TEST OPERATIONS PROCEDURE

\*Test Operations Procedure (TOP) 2-2-513  
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FOREIGN VEHICLES

Paragraph		Page
1.	SCOPE . . . . .	2
2.	FACILITIES AND INSTRUMENTATION . . . . .	2
3.	REQUIRED TEST CONDITIONS . . . . .	2
4.	TEST PROCEDURES . . . . .	2
4.1	Physical Characteristics . . . . .	2
4.2	Weapon Characteristics . . . . .	2
4.3	Electrical Systems . . . . .	2
4.4	Field of Fire . . . . .	2
4.5	Examination of Cannon . . . . .	2
4.6	Safety Evaluation . . . . .	3
4.7	Center of Gravity . . . . .	3
4.8	Weight Distribution . . . . .	3
4.9	Acceleration, Maximum and Minimum Speeds . . . . .	3
4.10	Steering . . . . .	3
4.11	Fuel Consumption . . . . .	3
4.12	Gradeability and Side-Slope Performance . . . . .	3
4.13	Obstacles . . . . .	3
4.14	Security from Detection . . . . .	3
4.15	Towing Resistance . . . . .	3
4.16	Drawbar Pull . . . . .	3
4.17	Off-Road Mobility . . . . .	3
4.18	Swimming . . . . .	3
4.19	Broadband Electromagnetic Interference . . . . .	3
4.20	Gun Control Systems for Vehicle-Mounted Weapons . . . . .	4
4.21	Field Artillery Fire Control Sights . . . . .	4
4.22	Stabilization Systems . . . . .	4
4.23	Boresight and Muzzle Reference System . . . . .	4
4.24	Vehicle Main Weapon Firing Tests. . . . .	4
4.25	Fording . . . . .	4
4.26	Night Performance . . . . .	4
4.27	Cooling Systems . . . . .	4
4.28	Endurance . . . . .	4
4.29	Vehicle Vulnerability . . . . .	4
5.	DATA REQUIRED . . . . .	4
6.	PRESENTATION OF DATA . . . . .	5

Appendix A.	REFERENCES . . . . .	A-1
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\*This TOP supersedes TOP 2-2-513 dated 5 October 1966.

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1. SCOPE. This document identifies procedures for conducting automotive and armament testing of foreign wheeled and tracked vehicles. Evaluation of the ordnance materiel of other nations has both immediate and long-range strategic advantages. The greatest benefit occurs in time of armed conflict, when a detailed analysis of the enemy's equipment could lead to effective counter-measures and improvement of existing defenses. The testing of all foreign military vehicles, including those of both friendly and enemy nations, is beneficial to the extent that effective new technology can be adapted to our needs without the need for expensive design and development programs.

The scope of testing may be limited by lack of spare parts, ammunition, pertinent fuel and/or lubricants, special tools and components, and the unavailability of technical literature pertaining to maintenance and service requirements. Maximum advantage must be made of replacing the missing components, parts, and material with comparable U.S. items whenever possible.

2. FACILITIES AND INSTRUMENTATION. Facilities and instrumentation are identified in the specific TOPs/ITOPs cited within this TOP.

3. REQUIRED TEST CONDITIONS. Test conditions are somewhat unique to each test procedure; they are identified in the TOPs/ITOPs cited within this TOP.

4. TEST PROCEDURES. Procedures to be followed are listed below in order of increasing severity with regard to the possible deterioration of a one-of-a-kind piece of equipment. Applicable tests should be performed, as closely as possible, in the order they are listed.

4.1 Physical Characteristics. Compile a listing of the test vehicle physical characteristics as described in TOP 2-2-500<sup>1\*\*</sup> and ITOP 2-2-500(1)<sup>2</sup>.

4.2 Weapon Characteristics. Compile a listing of the test vehicle's weapon characteristics as described in TOP 3-2-500<sup>3</sup>.

4.3 Electrical Systems. Determine the electrical requirements and capabilities of the vehicle and weapon subsystems in accordance with TOP 2-2-601<sup>4</sup>.

4.4 Field of Fire. Determine the restrictions which define or modify the field of fire of the vehicle-mounted weapons in accordance with TOP 3-2-813<sup>5</sup>.

4.5 Examination of Cannon (if applicable).

a. Determine internal dimensions of cannon in accordance with ITOP 3-2-802<sup>6</sup>.

b. Determine chamber pressures of cannon in accordance with ITOP 3-2-810<sup>7</sup>.

\*\*Superscript numbers correspond to those in Appendix A, References.

c. Determine the characteristics of the cannon material in accordance with TOP 3-2-807<sup>8</sup>.

4.6 Safety Evaluation. Conduct testing to determine safety of the test vehicle and its components in accordance with applicable portions of TOP 2-2-508<sup>9</sup>.

4.7 Center of Gravity. Determine the center of gravity of the test vehicle in accordance with TOP 2-2-800<sup>10</sup>. For tracked vehicles use ITOP 2-2-800(1)<sup>11</sup>.

4.8 Weight Distribution. Determine weight distribution and ground pressure in accordance with TOP 2-2-801<sup>12</sup>. For tracked vehicles use ITOP 2-2-801(1)<sup>13</sup>.

4.9 Acceleration, Maximum and Minimum Speeds. Conduct testing to determine full-throttle acceleration characteristics and maximum and minimum speed capabilities of the vehicle in each gear or range, in accordance with TOP 2-2-602<sup>14</sup>. For tracked vehicles use ITOP 2-2-602(1)<sup>15</sup>.

4.10 Steering. Conduct testing to determine steering characteristics in accordance with TOP 2-2-609<sup>16</sup>. For tracked vehicles use ITOP 2-2-609(1)<sup>17</sup>.

4.11 Fuel Consumption. Determine vehicle fuel consumption characteristics in accordance with TOP 2-2-603<sup>18</sup>. For tracked vehicles use ITOP 2-2-603(1)<sup>19</sup>.

4.12 Gradeability and Side-Slope Performance. Determine vehicle operational capabilities on longitudinal grades up to 60% and side slopes up to 40%, in accordance with TOP 2-2-610<sup>20</sup>. For tracked vehicles use ITOP 2-2-610(1)<sup>21</sup>.

4.13 Obstacles. Determine the ability of the test vehicle to negotiate standard obstacles in accordance with TOP 2-2-611<sup>22</sup>. For tracked vehicles use ITOP 2-2-611(1)<sup>23</sup>.

4.14 Security from Detection. For pertinent vehicles, conduct testing to determine security from detection characteristics in accordance with TOP 2-2-615<sup>24</sup>.

4.15 Towing Resistance. Measure vehicle power losses from suspension and running gear by conducting tests in accordance with TOP 2-2-605<sup>25</sup>. For tracked vehicles use ITOP 2-2-605(1)<sup>26</sup>.

4.16 Drawbar Pull. Determine vehicle drawbar pull characteristics in accordance with TOP 2-2-604<sup>27</sup>. For tracked vehicles use ITOP 2-2-604(3)<sup>28</sup>.

4.17 Off-Road Mobility. Determine capabilities of the vehicle during operation in various types of soft-soil conditions, in accordance with guidance presented in TOP 2-2-619<sup>29</sup>. For tracked vehicles use ITOP 2-2-619(1)<sup>30</sup>.

4.18 Swimming (if applicable). Determine vehicle performance capabilities

TOP 2-2-513  
1 April 1994

during operation in and over bodies of deep water, in accordance with TOP 2-2-501<sup>31</sup> or ITOP 2-2-501(1)<sup>32</sup>.

4.19 Broadband Electromagnetic Interference. Check vehicle and electrical subsystems for interference levels to radio frequency transmissions in accordance with TOP 2-2-613<sup>33</sup>.

4.20 Gun Control Systems for Vehicle-Mounted Weapons. Characterize the angular-displacement type control handle used in tank fire control systems in accordance with ITOP 3-2-836(2.3.1)<sup>34</sup>.

4.21 Field Artillery Fire Control Sights.

Conduct nonfiring tests of fire control systems, such as panoramic sights and elevation quadrants, in accordance with TOP 3-2-709<sup>35</sup>.

4.22 Stabilization Systems. Determine the weapon system's response to a varying input command in accordance with ITOP 3-2-836(2.3.2)<sup>36</sup>.

4.23 Boresight and Muzzle Reference System. Evaluate the boresight and muzzle reference system (MRS) alignment/retention capability of the gun/fire control systems in accordance with ITOP 3-2-836(2.1.1)<sup>37</sup>.

4.24 Vehicle Main Weapon Firing Tests. Determine the ability of the test vehicle's main armament and fire/gun control system to hit its target.

a. Artillery - Conduct testing in accordance with applicable portions of ITOP 3-2-506<sup>38</sup>.

b. Tank Weapons - Conduct testing in accordance with applicable portions of ITOP 3-2-605<sup>39</sup>.

4.25 Fording. Determine the fording capability of the test vehicle in accordance with applicable portions of TOP 2-2-612<sup>40</sup>. For tracked vehicles use ITOP 2-2-612(1)<sup>41</sup>.

4.26 Night Performance. Determine the vehicle's ability to operate at night in accordance with TOP 2-2-616<sup>42</sup>.

4.27 Cooling Systems. Conduct full- and part-throttle vehicle operations to determine the cooling characteristics of engine, power train, and auxiliary components when exposed to high-temperature environments, in accordance with TOP 2-2-607<sup>43</sup>. For tracked vehicles use ITOP 2-2-607(1)<sup>44</sup>.

4.28 Endurance. Determine the test vehicle's ability to operate over various test courses for prescribed distances or times, in accordance with TOP 2-2-506<sup>45</sup>. For tracked vehicles use ITOP 2-2-506(1)<sup>46</sup>.

4.29 Vehicle Vulnerability. Determine the test vehicle's vulnerability to weapon fire in accordance with TOP 2-2-617<sup>47</sup>.

5. DATA REQUIRED.

As specified in each of the cited TOPs/ITOPs.

6. PRESENTATION OF DATA.

As defined in each of the cited TOPs/ITOPs.

APPENDIX A. REQUIRED REFERENCES

1. US TOP 2-2-500, Vehicle Characteristics, 3 December 1981.
2. FR/GE/UK/US ITOP 2-2-500(1), Tracked Vehicle Physical Characteristics, 21 May 1987.
3. US TOP 3-2-500, Weapon Characteristics, 9 November 1981.
4. US TOP 2-2-601, Electrical Systems (Vehicles and Weapon Subsystems), 20 June 1977.
5. US TOP 3-2-813, Field of Fire, 22 March 1985.
6. FR/GE/UK/US ITOP 3-2-802, Measurement and Inspection of Gun Tubes, 14 May 1993.
7. GE/US ITOP 3-2-810, Electrical Measurement of Weapon Chamber Pressure, 18 December 1985.
8. US TOP 3-2-807, Nondestructive Testing of Materials, 5 December 1985.
9. US TOP 2-2-508, Automotive Safety and Health Hazard Evaluation, 24 November 1982.
10. US TOP 2-2-800, Center of Gravity, 18 July 1980.
11. FR/GE/UK/US ITOP 2-2-800(1), Tracked Vehicle Center of Gravity, 15 May 1987.
12. US TOP 2-2-801, Weight Distribution and Ground Pressure (Wheeled and Tracked Vehicles), 7 August 1981.
13. FR/GE/UK/US ITOP 2-2-801(1), Tracked Vehicle Weight Distribution and Ground Pressure, 15 May 1987.
14. US TOP 2-2-602, Acceleration: Maximum and Minimum Speeds, 28 January 1981.
15. FR/GE/UK/US ITOP 2-2-602(1), Tracked Vehicle Acceleration: Maximum and Minimum Speeds, 9 March 1987.
16. US TOP 2-2-609, Steering, 18 July 1980.
17. FR/GE/UK/US ITOP 2-2-609(1), Tracked Vehicle Steering, 18 May 1987.
18. US TOP 2-2-603, Vehicle Fuel Consumption, 4 February 1986.
19. FR/GE/UK/US ITOP 2-2-603(1), Tracked Vehicle Fuel Consumption, 18 May

TOP 2-2-513  
1 April 1994

1987.

20. US TOP 2-2-610, Gradeability and Side-Slope Performance, 18 July 1980.

21. FR/GE/UK/US ITOP 2-2-610(1), Tracked Vehicle Gradeability and Side-Slope Performance, 21 May 1987.

22. US TOP 2-2-611, Standard Obstacles, 25 June 1980.

23. FR/GE/UK/US ITOP 2-2-611(1), Tracked Vehicle Obstacles, 21 May 1987.

24. US Draft TOP 2-2-615, Security from Detection (Vehicles).

25. US TOP 2-2-605, Towing Resistance, 25 June 1980.

26. FR/GE/UK/US ITOP 2-2-605(1), Tracked Vehicle Towing Resistance, 13 March 1987.

27. US TOP 2-2-604, Drawbar Pull, 18 July 1980.

28. FR/GE/UK/US ITOP 2-2-604(3), Tracked Vehicle Drawbar Pull on Hard Surface, 21 May 1987.

29. US TOP 2-2-619, Soft Soil Vehicle Mobility, 21 May 1970.

30. FR/GE/UK/US ITOP 2-2-619(1), Tracked Vehicle Soft-Soil Mobility, 1 June 1987.

31. US TOP 2-2-501, Swimming Tests of Wheeled and Tracked Vehicles, 18 November 1980.

32. FR/GE/UK/US ITOP 2-2-501(1), Tracked Vehicle Swimming Tests, 20 May 1987.

33. US TOP 2-2-613, Broadband Electromagnetic Interference Testing for Vehicles and Electrical Subsystems - Noncommunications, 12 October 1983.

34. FR/GE/UK/US ITOP 3-2-836(2.3.1), Main Battle-Tank Fire Control Systems - Control Handle Characteristics, 6 March 1993.

35. US TOP 3-2-709, Field Artillery Fire Control Sights, 14 December 1987.

36. FR/GE/UK/US ITOP 3-2-836(2.3.2), Main Battle-Tank Fire Control Systems - Frequency Response of Weapon System, 27 April 1993.

37. GE/US ITOP 3-2-836(2.1.1), Main Battle-Tank Fire Control Systems - Boresight and Muzzle-Reference-System Alignment/Retention, 31 March 1987.

38. GE/US ITOP 3-2-506, Artillery (Self-Propelled and Towed), 3 March 1986.



- 39. FR/GE/UK/US ITOP 3-2-605, Tank System Accuracy/Reference Firing, 23 October 1992.
- 40. US TOP 2-2-612, Fording, 18 July 1980.
- 41. FR/GE/UK/US ITOP 2-2-612(1), Tracked Vehicle Fording, 18 May 1987.
- 42. US TOP 2-2-616, Night Performance of Combat Vehicles, 8 May 1981.
- 43. US TOP 2-2-607, Cooling Systems (Automotive), 6 January 1982.
- 44. FR/GE/UK/US ITOP 2-2-607(1), Tracked Vehicle Full Load Cooling, 21 May 1987.
- 45. US TOP 2-2-506, Endurance Testing of Tracked and Wheeled Vehicles, 26 June 1981.
- 46. FR/GE/UK/US ITOP 2-2-506(1), Tracked Vehicle Endurance Testing, 15 May 1987.
- 47. US TOP 2-2-617, Armored Vehicle Vulnerability to Conventional Weapons, 30 January 1975.

TOP 2-2-513  
1 April 1994

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